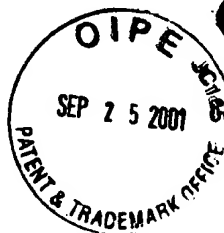


Abstract of the Disclosure



Overall permreactor-separator (or membrane reactor-separator) processes with integration of reaction and separation in one unit, increased mass and heat transfer, increased reactant conversion and product yield with internal stream recycling for the processing and conversion of methane, higher hydrocarbons, alcohols, carbon monoxide, natural gas, coal gas, landfill gas, biomass gas, and mixtures of methane or higher hydrocarbons with carbon dioxide, based on reforming reactions of these feedstocks with steam and/or carbon dioxide, dehydrogenation reactions of saturated hydrocarbons, and methane oxidation. Final exit streams from these gas phase processors contain pure hydrogen or synthesis gas (hydrogen and carbon monoxide, hydrogen and carbon dioxide mixtures), and can be used as direct feed in molten carbonate, solid oxide, proton exchange membrane, alkaline, phosphoric acid and other types of hydrogen driven fuel cells. Same final exit processed streams can be alternatively used for direct chemical synthesis in a variety of reactions such as methanol and gasoline synthesis, for various hydrogenations and hydrogen based reduction and synthesis reactions, and as feed in power generation systems such as gas turbines, gas engines, and various types of fuel cells.

Do NOT ENTER
Jan 24, 02

RECEIVED
SEP 27 2001
TC 1700